

# Stabilization of Damaged Structures

## Objectives

The U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate's Infrastructure Protection and Disaster Management Division (IDD) is conducting research and developing tools relative to the stabilization of damaged structures as a result of natural or man-made disaster events. In the case of an improvised explosive device (IED) attack, buildings can be damaged and become subjected to progressive collapse; failure can occur with little or no warning. This project is directed at saving the lives of first responders and the victims that are entrapped in a collapsed or semi-collapsed facility. It aims to understand the building configuration and design before it collapses. It promotes stabilization through the following:

- **Monitoring, Sensing Systems.** Research the state-of-the-art and knowledge gaps in monitoring and sensing technologies and modes of failure caused by an IED.
- **Post Collapse Assessment Tool.** Develop post-disaster tools and guidelines that facilitate the risk assessment and decision making process for first responders.
- **New Advanced Shoring Systems.** Analyze how to improve current shoring methods. Part of this study is to enhance the understanding brittle failure, which is the most dangerous and least understood building failure mode.
- **Building Information Modeling (BIM) First Responders Standard.** Create BIM model/module that can be adopted by industry and used by the first responder community to assist with disaster response.
- **Building Stabilization Technologies and Testing.** Perform testing and modeling on innovative stabilization techniques and materials for different building types after an IED attack.

## Challenges

This is a ground-breaking project—it is the first time that the stabilization of buildings is being studied in a holistic manner. After a disaster, buildings can become structurally compromised or unstable. Building failure modes are complex and are dependent on many factors. The creation of cutting edge sensing/monitoring, risk assessment and stabilization tools will involve creative thinking, bringing together national experts from within the government, academia, the private sector, and first responder community.



## Users

Universities, researchers, DHS commercial and government facilities; Counter Improvised Explosive Device Executive Office, State and local governments; code officials; industry, associations of engineers and architects, and first responders.

## Post Disaster First Responders Tools

After a disaster, first responders are the first group to arrive to the disaster scene. Typically, they are rushed to the area with limited information on the conditions of the site and buildings. This project will provide a series of reliable tools and methods for first responders to address situations related to collapse or near-collapse buildings after a disaster. When a disaster occurs, even the slightest changes, such as vibrations resulting from the steps of first responders or removal of debris, can cause a harmful failure. The Monitoring and sensing systems, the post collapse assessment tool, and the creation of a BIM for first responders, will be a great progress and advantage in the area of the stabilization of buildings.



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